REMARKS

The Examiner's reconsideration of the application is requested in view of the amendments above, accompanying drawings, and comments which follow. For convenience, each of the paragraph has been numbered below to correspond to the numbered paragraphs of the Examiner's Office Action.

First of all, the applicant and the undersigned would like to thank Examiner Chawan for the interview that was conducted on July 16, 2009 at 11:00am, by telephone. Participating in the telephone interview were Nick Pears, a co-inventor, David Stanley, the UK Attorney for the Applicant, and the undersigned.

The objectives of the present invention were reviewed. Mr. Pears explained that the nub of the present invention was the way in which an image to be recognized was processed in a number of different ways, and the different "processed images" that were thus obtained were then combined.

This was contrasted with the disclosure in Eraslan, the essence of which resided in processing many different original images in the same way. Reference was made to the use in Eraslan of a library of "Mug shots" of various different subjects.

Sub-para (a) of the present claim 1 was considered. The wording specifically recites "processing the image" (i.e. the original image mentioned in the first line of the claim) to provide an image set containing "a plurality of different processed images". However, the Examiner felt that it would be helpful if it were reinforced in sub-para (a) that the different processed images were derived from the original image to be recognized.

It was agreed that, if a clarifying amendment to claim 1 were effected as above, that would appear to provide a satisfactory distinction from Eraslan. Such an amendment is set forth above.

A similar amendment has likewise been made to claim 22.

Claims 25 and 26 were then considered. It was explained that a critical difference from the prior art was that Fisher's Linear Discriminant Analysis (LDA) was applied to 3D images rather than 2D images. The known advantages of using LDA for 2D images were not relevant to 3D images. The advantages that arose for 3D images were not predictable from use with 2D images.

The Examiner indicated that, if the reference to 3D were moved from the preamble to the body of claims 25 and 26, that should overcome the objection. Such an amendment has been made above.

Having dealt with the substantive issues of patentability, attention was then focused on the formal objections in the Examiner's paragraphs 3 to 8.

Examiner's paragraph 3 – it was agreed to change the spelling of "recognising" to "recognizing".

Examiner's paragraph 4 – it was agreed to insert headings into the specification as appropriate.

Examiner's paragraph 5 – the Examiner explained that, although Figs 1-4 looked clear enough on-screen, the text was a little fuzzy when printed. It was agreed that replacements sheets 1 and 2 of the drawings would be provided.

Examiner's paragraphs 6, 7 – the Examiner advised that the paragraph at the foot of Page 4 of the Office Action was to be ignored. It was agreed that claim 23 would be replaced by a claim that did not combine references to both apparatus and method.

Examiner's paragraph 8 – the Examiner proposed that the method claims should include some reference to what it was that performed the method steps – e.g. "a computer or processor". It was agreed that the method claims would be amended accordingly.

Response to Examiner's numbered paragraphs:

3. The spelling of "recognising" has been changed to "recognizing" in the claims.

4. Headings have been inserted into the specification as appropriate (new pages attached).

5. New drawings sheets 1 and 2 are presented in the attached pdf file.

6,7. Claim 23 has been cancelled and replaced by new claims 27 to 44 that contain relevant features corresponding to the method sub-claims 2 to 20.

8. Claims 1 and 25 have been amended to include a reference to a computer or processor.

9, 10. The central ideas of the invention are (i) to compute a representation of an image, that contains a set of many processed images, each of which is derived from the original image and (ii) to derive from this set of images a vector (image key) that is compared with previously stored image keys to enable recognition of the original image.

Expanding on point (i), suppose one has an image that is N rows by M columns, then one could derive a set of processed images, typically each of which is also of size N by M, such that any particular processed image represents some image property across the NxM pixels of the image. For example, in the case of a standard 2D image this property could be a color or a brightness, in the case of a 3D image (range image), this could be the local surface curvature or local surface gradient. Thus this plurality of different processed images, can be imagined as an M by N by K block of data values, where there are K different image properties at each of MxN image locations. In the case where the original (source) image is registered 2D/3D data, for example, in the case of 3D cameras that simultaneously capture both 2D (color) and 3D (depth) information at each of the MxN pixel locations, the set of K properties could contain a mixture of properties, some derived from the 2D component of the original image and some properties derived from the 3D component of the original image. The set of K processed images could also contain the original data; that is we conceive the possibility of a null process, that does not change the original data. It is not essential that each "processed image" is of identical dimensions – as is made clear in the present description.

In contrast to this, Eraslan uses many different images, where all of the images are original images that are different from one another. The example given on col 11, lines 34 to 61 is a database of "mug shot" photos as used by a justice department. Indeed, Eraslan provides no

automated recognition step, but is concerned with generating an image of a suspect's head from pre-stored images. For example, on col 12, lines 54-64, it is made clear that is a law enforcement technician who forms a human face by selecting and assembling facial feature parts and shapes from an inventory. It is the technician who selects the nose shape etc (line 60) and the technician who selects other facial feature shapes (lines 62-63). All of the Eraslan claims are directed to an "image generation system". In the context of Eraslan, it is a human witness who ultimately does the recognizing, from images generated by the Eraslan image generation system.

Thus, there is no concept in Eraslan of subjecting an original image to a plurality of different processes, combining those different processed images, and ultimately performing a recognition step against a stored image key derived from the combined, different processed images. Such a concept would be quite inconsistent with Eraslan.

Claim 1 (etc) has been amended as discussed with the Examiner, to emphasize the point that , in step (a), the "different processed images" are all derived from the original image (that mentioned in the first line of the claim) that is to be recognized.

11. Fishers Linear Discriminant Analysis (LDA) has been previously applied to 2D face data, as a means of dealing with variations in ambient lighting and head pose variations. However, 3D sensors project their own light source and hence variations in ambient lighting are not a significant problem in 3D recognition. Furthermore, it is possible to normalize pose, thus vastly reducing the effects of head pose variations in 3D data. Thus it is not an obvious generalization to move LDA from 2D data to 3D data. There are, however, artefacts of 3D imaging not present in 2D imaging, such as noisy depth values generated at acute angles of incidence between the projected light and the 3D object surface. Such noise artefacts are undesirable and can be mitigated by the use of LDA. Thus, the combined features of claims 25 and 26 afford a novel solution to problems that have never been envisaged with the processing of 2D data. Accordingly, there would have been no motivation to modify Eraslan to adopt the disclosure of Liu, as the only benefits of LDA known at the time were relevant only to 2D imaging.

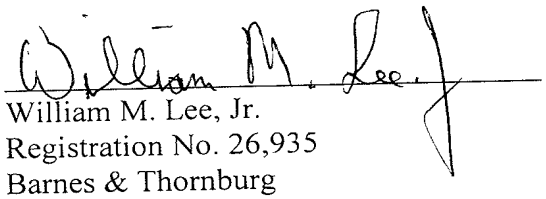
Claims 25 and 26 have been amended, as discussed with the Examiner, to move the reference to 3D to the main body of the claim.

Claim 22 previously had no claims dependent thereon. New claims 27 through 44 rectify that oversight. As all claims are dependent upon claim 22 and claim 22 is believed to be allowable, those claims are submitted to be allowable, as well.

In view of the foregoing, all is believed to be in order and the application is believed to be in condition for allowance. The Examiner's further and favorable reconsideration in that regard is therefore urged. Also, since this response is being submitted during the fifth month following the Examiner's Office Action, an appropriate Petition for Extension of Time is being submitted herewith.

July 21, 2009

Respectfully submitted,



William M. Lee, Jr.
Registration No. 26,935
Barnes & Thornburg
P.O. Box 2786
Chicago, Illinois 60690-2786
(312) 214-4800
(312) 759-5646 (fax)

CHDS01 WLEE 550199v1